A STUDY ON SOLID WASTE GENERATION AND COMPOSITION FROM COMMERCIAL SOURCES (CASE STUDY: TAMAN TAS KUANTAN)

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ABSTRACT

Solid waste is a useless material and unwanted material products that is no longer use and has been discarded by the society. However, the increasing of the population in our country is obviously affecting the production of solid waste especially from commercial sources. This study will determine the solid waste generation and composition of commercial sources at Taman Tas Kuatan, factors that affecting solid waste generation and review the solid waste management at Taman Tas. Ten premises are randomly chosen as the samples and they are classified into two types of premises which are product premises and service premises. Methods that are used to collect the data were through field work and questionnaires. The data was collected within one month which is on 18 th March 2012 until 14 th April 2012. The result shows that service premises contributed the highest solid waste generation rate which is 6.21 kg/commercial unit.day while product premises only contributed 3.81kg/commercial unit.day. The highest solid waste generated from commercial sources at Taman Tas Kuantan is food and organic waste which is 76% where it was mostly generated by service premises. This is because of size of the population, level of standard living, waste separation or recycles at source and the influenced of the events. Education to the society is also essential to give awareness and education to reduce the generation of solid waste at Taman Tas Kuantan.

ABSTRAK

Sisa pepejal ialah bahan yang tidak berguna dan produk yang tidak lagi diperlukan dan dibuang oleh masyarakat. Namun begitu, peningkatan penduduk di negara kita menyebabkan pengeluaran sisa pepejal terutamanya dari sumber-sumber komersil. Kajian ini akan mengkaji penghasilan sisa pepejal dan komposisi sumber komersil di Taman Tas Kuantan, mengkaji faktor- faktor yang mempengaruhi penjanaan sisa pepejal dan mengkaji semula pengurusan sisa pepejal di kawasan ini. Sepuluh premis dipilih secara rawak sebagai sampel dan dikelaskan kepada dua jenis premis iaitu premis produk dan premis perkhidmatan. Kaedah yang digunakan utnuk mengumpul data ialah melalui kerja lapangan dan boring soal selidik. Data dikumpulkan selama sebulan iaitu pada 18 Mac 2012 sehingga 14 April 2012. Keputusan menunujukkan bahawa premis perkhidmatan menyumbang kepada penjanaan sisa pepejal yang lebih tinggi iaitu 6.21kg/unit komersil.hari manakala premis produk hanya menyumbang 3.81kg/unit komersil.hari. Sisa pepejal yang paling tinggi terhasil dari sumber komersil di Taman Tas Kuantan ialah makanan dan sisa-sisa organik iaitu 76% dimana ianya banyak dijana dari premis perkhidmatan. Ini adalah disebabkab oleh saiz penduduk, kedudukan taraf hidup, pengasingan atau mengitar semula di punca dan dipengaruhi oleh peristiwa-peristiwa. Pengetahuan kepada masyarakat adalah penting untuk memberi kesedaran dan pendidikan untuk mengurangkan penjanaan sisa pepejal di Taman Tas Kuantan.

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LIST OF SYMBOLS AND ABBREVIATIONS

MSW	- Municipal Solid Waste
%	- Percent
EPA	- Environmental Protection Agency
Kg/hr	- Kilogram per hour
U.S	- United States
USM	- Universiti Sains Malaysia
WWF	- World Wildlife Fund
UKM	- Universiti Kebangsaan Malaysia
MSWG	- Municipal Solid Waste Generation
Btu	- British thermal unit
SWM	- Solid Waste Management
Kg/commercial.day	- Kilogram per commercial a day
UNIMAS	- Universiti Malaysia Sarawak
Kg/day	- Kilogram per day

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Commercial solid waste is a useless material and unwanted material products in a solid state that is no longer use and has been discarded by the society. The increasing of the population in our country is obviously affecting the production of solid waste. There are three main factors that are expecting on the rising of the waste generation in Kuantan which is rapid urbanization, populations and increasing in worldwide industrialization. Despite of the development of commercial activities in our country, the production of waste generation is seemed to be increasing too.

Hence, solid waste is one of three biggest environmental problem occurred in Malaysia. Just like other country such as China and India, the effect of this growing waste generation in our country also gaining attention and became the biggest issue. Therefore, the improvement in managing the commercial solid waste such as the collection, recycling and disposal will be the most important goal in a few coming

years since this problem need to be fix seriously and manage properly in order to sustain life.

Currently in Kuantan, it was found that over five hundred metric tons of waste is produced daily. However, this amount is expected to increase by ten percent annually since the rapid growth in population and development activities is keep on increasing. Therefore, the amount of waste generated continues to increase and approximately eighty percent of waste is sent to landfills and another fifteen percent is recycled.

1.2 Problem Statement

Regarding to the issue of the landfill is getting full with the waste produce by the society nowadays (Ismail, 2006) this might become the biggest challenge to face in the future. Waste Management Office in Kuantan city now is facing a huge problem since the public is still lack of awareness on the disposal of their waste. They are rarely doing the waste separation at source and almost all of them are not involving in recycling their wastes.

Therefore the municipality faces so much inconvenient matters and problem such as un-renewed waste transportation trucks, un-maintained bins, rising fuel costs. Waste Management also confronted with the delays caused by rainy day, disturbances from free roaming animals, narrow roads, vehicle obstacle during collection and increase in illegal dumping. All of these problems is caused by the society and yet will affect the future generation if prevention and solution is not taken from earlier.

1.3 Research Objectives

The objectives of this study are;

i. To identify solid waste generation and composition at commercial area in Taman Tas, Kuantan.
ii. To determine the factors effecting solid waste generation rate from commercial sources at Taman Tas, Kuantan.
iii. To review the solution for solid waste management at Taman Tas, Kuantan.

1.4 Scope of Study

This study has been conducted at commercial premises that are located at Taman Tas Kuantan, Pahang. Ten types of premises were randomly chosen as samples. The sample areas are chosen at different location around Taman Tas in order to oversee their solid waste production. The areas of sampling are divided into three parts. There are area A (Clinic, Bakery, Sing ABC Restaurant, Zinhing Restaurant), while area B (Food Stall A and Food Stall B) and area C (Malay Restaurant, Wah Ping Restaurant, Grocery store, Lian Huat Restaurant) as shown in Figure 1.1 below;

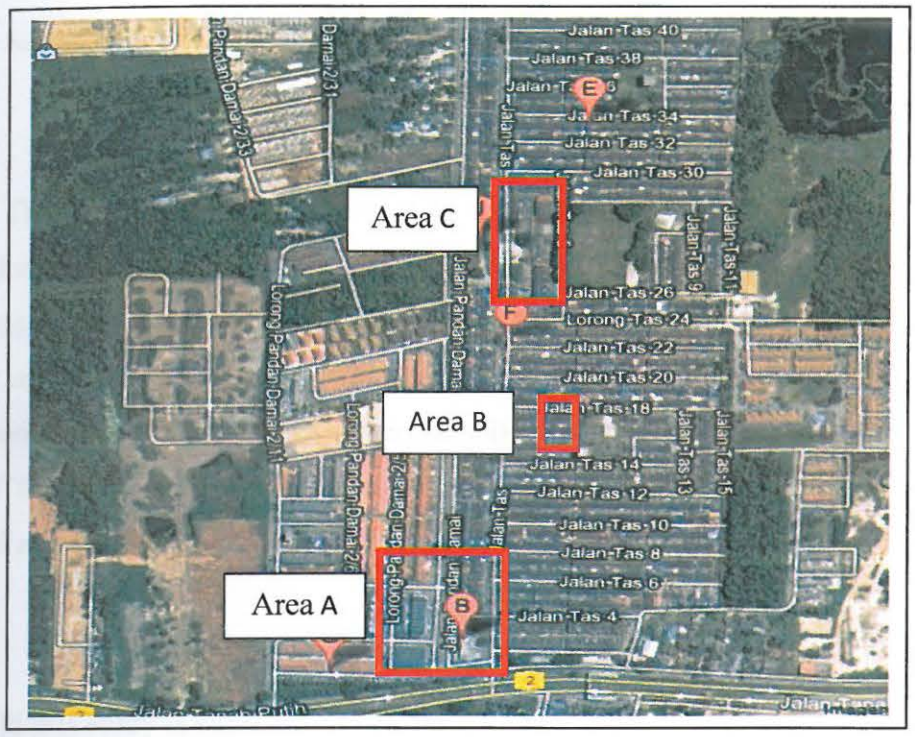

Figure 1.1: Study Area of Commercial Sources at Taman Tas Kuantan

Solid waste production might be different since the activities of each premise are typically different to each other and the population of the area is different too. The data collected by using two methods;

i. Field Work - Segregation and Weighting of Solid Waste at point source
ii. Surveying by distributing questionnaires

Data that has been gathered are analyzed using Microsoft Office Excel and Graph. The data are analyzed by weekly and monthly in order to see the pattern of solid waste generated. Based on standard, for this study the commercial solid waste compositions are more focusing on food or organic waste, plastic waste, paper waste, glass waste, aluminum waste and other waste.

1.5 Significance of Study

This research is very important to conduct since it is the major and serious issue that Malaysia encountered now. Improper and non effective handling of commercial solid waste has worsened the situation because the landfill cannot occupy all the wastes that are produced by our societies. Thus, by conducting this study soon, we will know the commercial solid waste composition dispose currently by and the percentage of the composition for each type wastes disposed at the selected area.

If this study is successful later, the data that are collected and recorded might be useful for future management where it makes easier for government to handle the waste. It will be the way of solid waste to be minimized at the landfill area. Somehow, this is also supporting the mission of our country to segregate all the wastes in the future and only dump the unrecyclable wastes into the landfill area.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Solid waste can be defined as an unwanted material or unused composition which is dumped by the communities. "The Malaysian population has been increasing at rate of 2.4% per annum or about 600, 000 per annum since 1994" (Mohd. Armi, 2009). It shows that solid waste becomes one of the most crucial issues in our country now due to the growth of population rapidly. Despite the growth of economy and population in Malaysia the generation of solid waste will reach double in the next twenty years (Saeed, 2009).

In Kuala Lumpur alone, it was expected that the capital city waste generation will continuously rising every year due to uncontrollable society attitudes, increasing of high living standard and increasing in population. In next twenty years, the solid wastes are expecting to rise from 3.2 million tons a year to 7.7 million tons a year (Hassan, 2009). In 2000, the solid waste generated in Kuala Lumpur seems to be increased from 2620 tons in 1995 to 3070 tons. Thus, the total solid waste generated

in this city is estimated to be 4000 tons per day. Accelerate in population and economy growth are seems to be the main agent in solid waste generation.

As for Kuantan city, Kuantan's populations are now more than 412, 000 peoples since 2008 (Ramali, 2008). Furthermore, in Kuantan Pahang itself, the total of domestic solid waste produced is exceeding 125, 000 tons and about 500 metric tons of solid waste is produced per day. In fact, only 15% of waste being recycled but another 80% of solid waste is dumped to the landfill at Jerangau.

Our societies tend to dump their wastes instead of reuse or recycle their waste. Somehow, dumping site nowadays are getting full and over loaded by the waste, yet authorities management worried that no enough spaces for landfill to be construct later (Nadiah, 2011). Therefore, proper solid waste management by authorities and high awareness attention from society should be the way to handle this problem.

2.2 Types of Waste Sources

Figure 2.1 show that commercial area source is the second larger of contribution to the solid waste generation at developed countries.

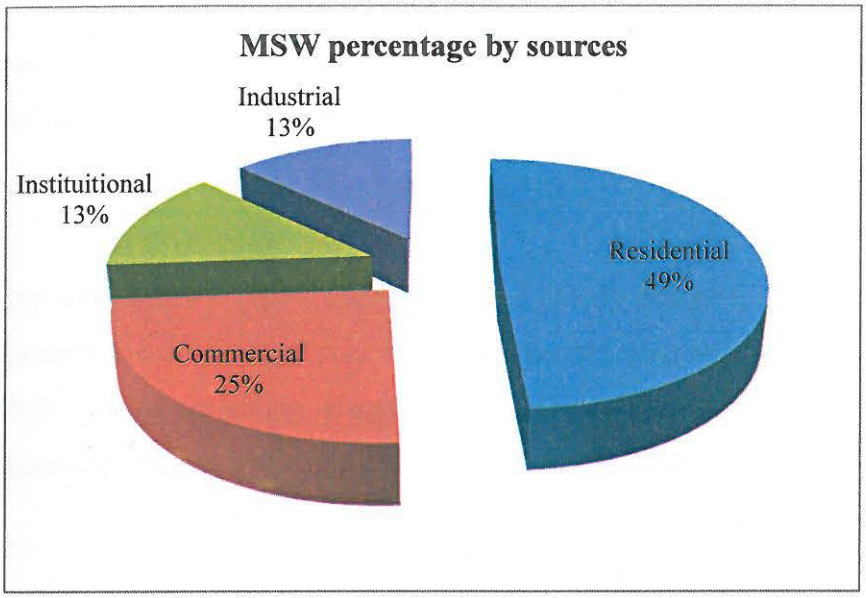

Figure 2.1: Typical MSW percentages by Sources in Developed Countries

Source: Hickman (1999)

2.2.1 Municipal Solid Waste (MSW)

MSW is always referred as a household waste and less hazardous wastes. United State Environmental Protection Agency (EPA) also defined MSW as an everyday items used and been throw away then as garbage or trash such as "product packaging, grass clippings, furniture, clothing, newspaper and batteries" (EPA, 2010). These wastes usually product of houses, schools, hospital and offices. Thus, this waste is one of the largest contributors to the problem of land pollution.

Improper collection, transporting and disposal of this waste will leads to health hazards. "The particular concerns of unmanaged wastes arise during rainy season, high temperature and when there are settlements in close proximity or the low-lying area" (Penjor, 2007). It means that, more awareness of this unmanaged waste needed especially during wet season, even in high temperature and low area as well. This is because during the changes of the seasons, especially wet season or rainy season, the environment humidity will be very high, hence it can increase the condition of health hazard.

If the solid waste is throw everywhere and openly dumped, it will serves as a breeding ground for the mosquitoes, flies, cockroaches, rats and other pest (Pejor, 2007). "High risk of spreading diseases like typhoid, cholera, dysentery, yellow fever, encephalitis, plague and dengue fever also exist in such an environment (Teri, 2006).

2.2.2 Industrial Waste

"All solid waste generated from industrial or manufacturing activities such as service and commercial establishments. Industrial solid waste does not include office materials, restaurant and food preparation waste, discarded machinery, demolition debris or household refuse" (Minnesota, 2011). It is usually refer to the industry or factories waste which contents toxins and can harm the environmental. If it is handle improperly, it can cause hazard and dangerous to public health and environment too.

Usually industrial waste will be handling properly by the authorities despite of its dangerous behavior. However, most of the time we used to hear lots of issue

about industrial waste dumped into the river. Obviously, this was happened on September 2011 at Chao Phraya River, Thailand where this river seems to be increasing polluted by the industrial waste dumping lately and started giving off bad odor every time the waste was dumped (Environment News Service, 2011). According to a World Health Organization report, diarrhea caused by this type of contaminated water causes 2.2 million deaths each year worldwide. Thus, it shows that wastes issue is critical widely over the world.

2.2.3 Other Waste

2.2.3.1 Hazardous Waste

Hazardous waste is known as unwanted material that can harm physically if they are not handled well and managed properly based on specification terms. In Bangkok 2011, the water river has been polluted by wastewater released from the factories that was worrying the society that the risk is underestimated as it can cause many diseases including typhoid (Environment News Service, 2011). This type of solid waste is generally handled by skilled person and private company.

2.2.3.2 Clinical Waste

"These wastes include materials like plastic syringes, animal tissues, bandages, cloths, etc."(Pipatti et. al, 2006). Usually clinical waste is incinerated. However, some of clinic wastes are disposed in SMDS. Consumers' Association Penang stated that "In 1995, as the Malaysia's clinic waste management and hospital support services being privatized, the regional and onsite medical waste incinerators were built". The incinerators capacity is 20 to 500kg/hr where there are five regional

medical waste incinerators currently. Moreover, there are three more regional incinerators with the capacity of 200kg/hr each are still under planning and will be construct soon. Meanwhile, for small onsite medical waste incinerators, there are five regional with capacity 20kg/hr and two regional with capacity 50kg/hr.

2.4 Composition of Municipal Solid Waste (MSW)

There are many types of MSW composition that can be classified. Waste composition is one of the main factors implementing in solid waste treatment since solid waste has difference characteristics between each other. Based on standard, there are five compositions of solid waste that was identified such as aluminum, glass, plastic, paper, and food waste. Figure 2.2 below shows the percentage of MSW recyclables at Kuala Lumpur city.

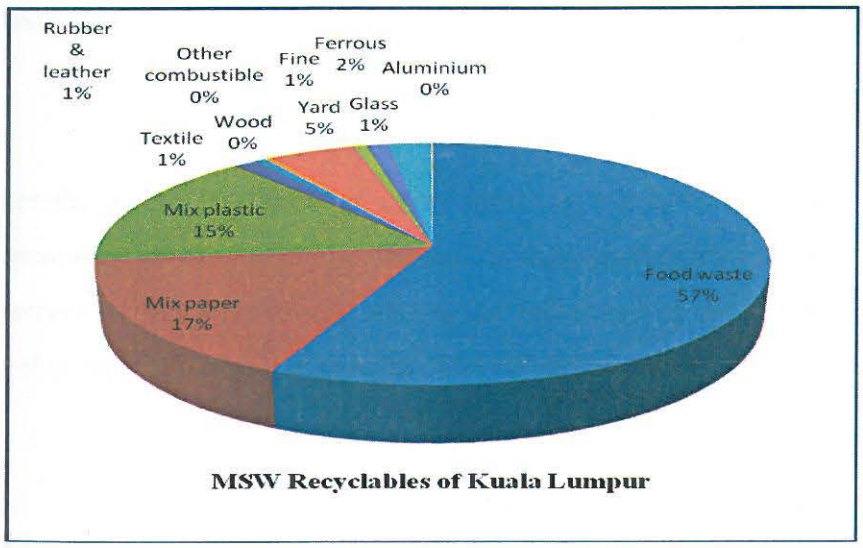

Figure 2.2: Percentage of MSW Recyclables of Kuala Lumpur 2009

Source: Mohamed Osman Saeed et al.(2009)

2.4.1 Glass Waste

Glass can be defined as a material that is fragile and easy to break into pieces. Since last decades, glass had become a universal container to pack the liquids form such as wine and oil. But nowadays, manufacturer has used glass as a main material to hold everything which is from soda to perfume (EPA, 2011). We can see the glasses product in many types of shapes and colours. Besides, it is typically used as a main material to produce kitchen tools or equipments.

Usually glass can recycle over and over again as long as its strength still good and retain especially beverages container. In fact, there is 90 percent of recycled glass is used to make new containers. Environmental Protection Agency (EPA) also stated that "glass recycling increased from 750,000 tons in 1980 to more than three million tons in 2010. Food, soft drink, beer, food, wine, and liquor containers represent the largest source of glass generated and recycled".

2.4.2 Plastic Waste

Over the centuries, almost of every aspect of our lives are using plastic. It keeps on increasing due to the public demand. In fact, plastics have contributed more than 12 percent of MSW stream. It shows the increment of plastics waste stream from 1960 that only less than one percent of MSW stream (EPA, 2011).

EPA also has stated that "The largest category of plastics are found in containers and packaging (e.g., soft drink bottles, lids, shampoo bottles), but they also are found in durable (e.g., appliances, furniture) and nondurable goods (e.g.,

diapers, trash bags, cups and utensils, medical devices)". This data is according to United States country. It may be lesser in developing countries.

However, people do not hesitate in disposing the good plastic since plastic is abundance, easy to handle and handy and disposal nature is mostly packaging. Therefore, plastic wastes are rapidly increased and constitute the highest percentage by volume and by weight in the MSW over the year (Penjor, 2007). "It typically comprises around 7 percent of the MSW by weight but larger in volume (Tchobanoglous et al, 1993).

Recycling of plastics should be carried in such a manner to minimize the pollution during the process and as a result to enhance the effectiveness of the process. But the recycling process depends on the type of the plastic. Hence, segregation method must be applied to separate the plastic. According to Temmemagi, 1999 and Tchobanoglous et al, 1993 there are categorical classification symbol and codes respectively for waste plastic separation which is given in Figure 2.3 and Table 2.1.

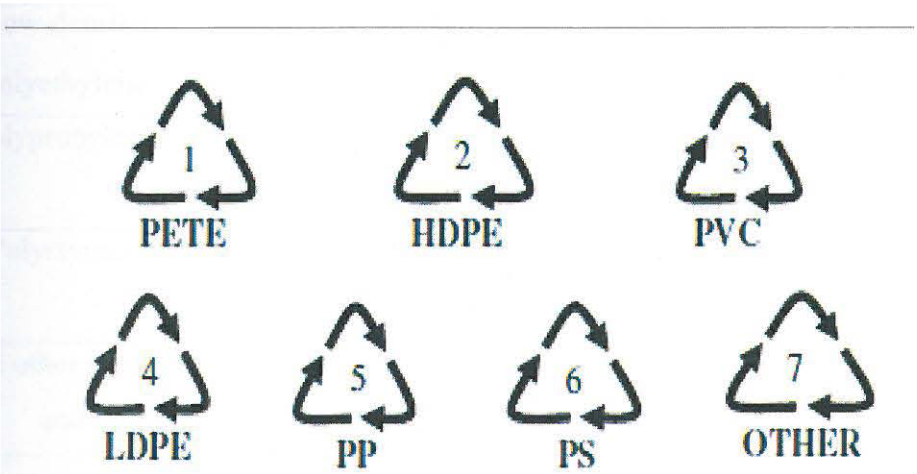

Figure 2.3: Symbol Used for Identification of Plastic

Source: Adapted from Tammemagi (1999)

1. Polyethylene terephthalate (PETE/1)
2. High-density polyethylene (HDPE/2)
3. Polyvinyl chloride (PVC/3)
4. Low-density polyethylene (LDPE/4)
5. Polypropylene (PP/5)
6. Polystyrene (PS/6)
7. Other multilayered plastics (7)

Table 2.1: Classification, Identification Codes and Uses for Common Plastics

Material	SPI Code	Original uses	% use for packaging
Polyethylene terephthalate	1-PETE	Carbonated soft drink bottles	7
High-density polyethylene	2-HDPE	Milk bottles, detergent bottles, film product such as produce	31
Vinyl/polyvinyl Chloride	3-PVC	Household and food product containers; pipe	5
Low-density Polyethylene	4-LDPE	Thin-film packaging and wraps; other film materials	33
Polypropylene	5-PP	Crates, cases, closures and labels	10
Polystyrene	6-PS	Foamed cups and plates; injection molded items	10
All other resins and	7-other	Commingled plastics	4

Source: Tchobanoglous et. al (1993)